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Towards a Goal Oriented Action Planning Approach for Predator-Prey Simulation

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Abstract.
Here we summarise a work-in-progress towards implementing a goal oriented action planning approach, GOAP, which formulates a plan from a list of possible actions in order to achieve a goal. One of the potential benefits of such an approach, apart from requiring less specification from the programmer, is that entities may derive unexpected solutions. The GOAP implementation is being used for application to a simple predator-prey simulation.

1 GOAL ORIENTED ACTION PLANNING

Planning is a vital capability for game entities. An important question is how an AI may generate its own goals and actions based on high-level specifications, a storyline for example [1], without the necessity for the programmer to provide details for every possibility that may occur. Adaptive planning systems help in this respect, requiring only the specification of goals, actions and relationships: actions can then be undertaken in an automatic manner in order to achieve these goals. Based on STRIPS, the Stanford Research Institute Problem Solver [2], goal oriented action planning, or GOAP [3], plans a path of actions for fulfilling a goal and has been used for the AI in the computer game, FEAR, by Monolith Productions. GOAP is flexible, and useful for dynamically finding solutions for fulfilling a goal when a previously available action can no longer be executed. Our use of GOAP is intended to replace the decision-making system of a predator-prey simulation, currently implemented using decision trees, in order to provide more flexible planning capabilities for the entities in the simulation and investigate extensions to planning.

2 IMPLEMENTATION

The predator-prey simulation features entities navigating around a simple 2D grid environment, who must forage for food or hunt. Entities currently return to a den depending on foraging/hunting success, presence of predators, and the time of day. In addition to the standard GOAP implementation described in [3], we are are investigating a number of extensions: these include varying the types of precondition values used in the algorithm, associating timings with actions in order to be able to formulate efficient plans, and an investigation of different forms of energy metrics [4], for example, taking actions with immediate effects on the goal and other needs into greater account. Thus far, a basic GOAP prototype has been created suitable for scenarios relevant to the predator-prey scenario (see Figure 1). Entities navigate the environment, searching for sources of nutrition and attempting to avoid predators. Currently, decision-making in this simulation is conducted using decision trees.

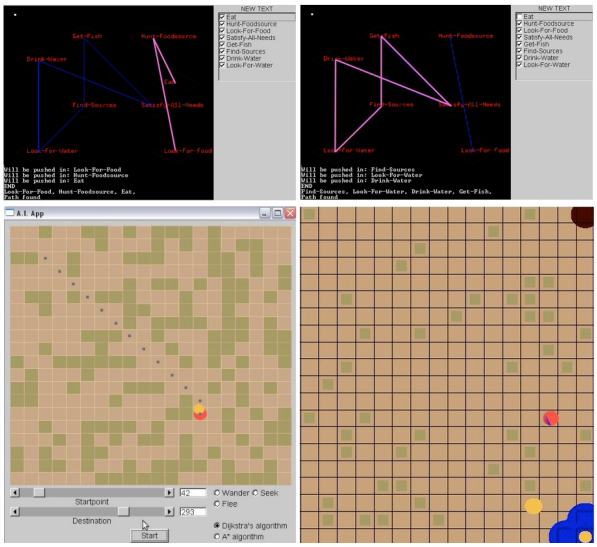

Figure 1. Top row: example scenarios within our GOAP test interface. Bottom row: example of the predator-prey scenario.

Our next step is to integrate the GOAP prototype into the predator-prey simulation, investigating extensions specific to it. An interesting possibility is the consideration by entities of the theorised goals/locations of competitors in the planning of future activities.

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